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ABSTRACT

This paper is divided into two sections. The first section presents a discussion of the characteristics of the disadvantaged child and the ways in which the philosophy and approach of the Science Curriculum Improvement Study (SCIS) meets his/her needs. The second half is devoted to the descriptive reports from teachers and administrators in whose schools the SCIS materials were used. Thirteen school systems throughout the United States are discussed. (SA)

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SCIS and the Disadvantaged

A Report From the Field

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March, 1970

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INTRODUCTION

From its beginnings, the Science Curriculum Improvement Study has been concerned about and involved in the challenges of improving educational programs in urban America. Starting in 1963 with the first trials of SCIS units, center city classrooms have been part of the early explorations and the continuing trials of preliminary versions of those units now becoming available to the general public in their final edition. Rather than emphasize the academic limitations, or other alleged lacks of center city children, the project has assumed that by starting early (kindergarten or first grade) and providing meaningful, relevant materials with which children can have direct experiences, it is possible to help all children develop their educational potential to the fullest. It has become apparent that the philosophy, content and approach embodied in SCIS curriculum materials provide challenging, exciting and meaningful educational experiences for disadvantaged youth. The second part of this report is made up of reports from teachers and administrators in cities throughout the United States where the materials are proving to have just such value. Before presenting these reports we shall look briefly at the characteristics of the disadvantaged child and then examine how the philosophy and approach of SCIS tends to meet his needs.

Claude Walls, science supervisor of District 4 in Philadelphia, describes the general setting as follows:

> *The middle class value for education has little chance for success in the 'inner school' where the relationships of the home, the school and the community often present conflicting points of view. In a more affluent atmosphere, the home is seen as an extension to the regular school day. A time for homework and a place to do it, as well as parental aid are provided the child on a regularly scheduled basis....While pride and concern for home and family may be as intense in the less affluent community, immediate and pressing concern for economic as well as physical survival takes precedence over homework and the strengthening of educational values through evening 'lessons'.*

Yet, alarmingly, though the traditional school program appears to be less and less relevant to the child trapped in the ghetto, its possible long-term value to him as an individual in an urban society is increasing. The Coleman Report expresses this change.

> *...as society becomes more urban, as occupations become less manual...the importance of school itself increases....The facts of life in modern society are that the intellectual skills, which involve reading, writing, calculation, analysis of information, are becoming basic requirements for independence, for productive work, for political participation, for wise consumption. Such intellectual skills were far less important in the simpler rural society from which ours has grown, and, as in all such rural societies, the schooling to develop these skills was less important there.*[1]

The child in the inner city has myriad experiences in his preschool years: he dresses himself, goes out on the street, can hold his own with his peers and develops friendships, becomes acquainted with games and stories shared by peers or adults, learns to determine which situations are questionable and which are safe. He develops relationships with adults, family, sisters and brothers and essentially becomes an independent person. He has accumulated this body of knowledge and attitudes from direct experiences.

Yet when the child arrives at school he finds that much of what he has experienced for the previous five years is unimportant to the school--often even discredited as unacceptable. Even with the growing concern about cultural bias in our school books, the reality of the child's life and the nature of his classroom experience do not correlate. There may be pictures of black or Puerto Rican lawyers or engineers in his primer or on the classroom walls--but these were not the men on his street.

When a child confronts a new situation on the street or at home, his first reaction is to touch it, to manipulate it to see what it can do and what he can do with it--and to start asking questions about it. If another child, a parent or other adult can supply some of the initial answers, he has a verbal label for what he has seen. Now that he sees the significance of the material or the event, he can start answering his own questions. This natural learning sequence which involves the spontaneous curiosity of children is at the heart of the SCIS program.

In order for such natural learning to take place, the child needs direct contact with the phenomenon and he must feel free to explore the occurrence on his own terms, as it has meaning to him. This naturalistic approach to learning is often antithetical to traditional methods where so called "discovery activities" consist of going to more books, taking part in a very structured field trip or watching a "talk-dominated educational film."

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[1]Coleman et. al., Equality of Educational Opportunity, (Washington, D.C.: U.S. Department of Health, Education and Welfare, U.S. Government Printing Office, 1966), page 218.

Celia Stendler-Lavatelli, Professor of Psychology at the University of Illinois, discusses the need for early direct experience:

> *Piaget has written of the dangers of premature verbalization; he maintains that the child can receive valuable information via language only if he is in a state to understand the information. In science, direct physical experience, either through demonstration or experimentation, is essential to readiness for most concepts in the curriculum. Furthermore, the learner needs the opportunity for corrective feedback gained in interaction with his peers as well as his teacher. Such experiences of concrete manipulation and interaction with classmates are provided in the laboratory approach.*[2]

It is important to note that the emphasis is not only on direct experiences but also on opportunities for socialization, discussion and the trying out of one's ideas on one's peers. As the disadvantaged child has success and finds his ideas are considered, and at times accepted by others, the usual school pattern of experiences which lead toward a negative self image is changed.

As indicated in the reports from the field, the emergent pattern is that extensive early experiences with real objects in a loosely structured situation motivates the child, especially the disadvantaged child, to describe and discuss his experiences with his peers and others. Since the experience takes place in the school and is related to objects usually new to most of the children in the class, the limited prior school-oriented experience of the disadvantaged child is not as much of a problem for him. The experience and discussion is not based on a world foreign to his experience (that of the primer) but rather is based on something in his hands. The language used in science is a combination of rather naturalistic, descriptive and comparative terms like "rough", "smooth," "bumpy," "it turns blue," "it's all eaten up" (dissolving), and special organizing and analyzing terms like "system," "evidence of interaction," "habitat," and "community." Thus the disadvantaged child is able to relate the descriptive terms to his own experience and is on somewhat equal footing when it comes to learning the somewhat abstract specialized language of science. He will need help with broadening his repertoire of descriptive and comparative language, but this can be given in the context of actual experiences which form a more natural and less threatening approach to learning.

As the child's language ability evolves, he is able to participate in discussion and more effectively offer his own ideas and observations.

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[2]Celia Stendler-Lavatelli, "Individualization Through the Laboratory Approach," SCIS Newsletter, No. 12, (Spring 1968), page 4.

Such experiences broaden and improve the disadvantaged child's self concept and reduce his feelings of alienation towards school. Based on her work with SCIS materials in Harlem, Mary Budd Rowe, SCIS Center Coordinator and professor of Natural Sciences at Teachers College, Columbia, presents the point of view as follows:

> *It seems to me that the great advantage of the SCIS lessons and the kind of instruction we want to go with them may amount to a successful intervention to save the self-concept. The objects provide concrete experience. But more importantly, the adult teacher and the child interact along the verbal dimension based on a shared continuity of experience. The permission to have confidence in what each observes may change the way the adult and children live together. In short, the primary advantage of the program may be the respect it gives to an individual's observations and the encouragement that it gives to the development of a new sense of self!*[3]

This new sense of self, combined with experience in and knowledge of the processes of science, further assists the child in his relationship to his environment. Dr. Rowe comments further in the following way:

> *Science and prediction (in contrast to prognostication) go together. For example, the more I know about a system the more I am likely to be able to act on it in definite ways and expect certain results. Prediction rests on belief that events are not totally capricious; what I do to the system makes a difference in how the parts act. I can, in some way, act to control the fate of the system. The building of this belief represents possibly the single greatest contribution science can make to the education of the inner city, 'disadvantaged' child.*[4]

The emphasis so far has been on the disadvantaged child and the educational advantages to him of a structured, materials-centered science program like SCIS. Implied in this entire discussion has been the need for a redefinition of the role of the teacher. He must evolve from the traditional authority figure who dispenses information, to an informed professional who acts as a facilitator of learning by fostering instructional interactions among children, materials and her or himself. If, for example, silence is considered the evidence of a good classroom atmosphere, then little or no opportunity for informal discussions about materials will be provided. In such a situation most of the benefits of a materials-centered science program as described earlier are lost. Encouraging children to work together

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[3]Mary Budd Rowe, "SCIS in the Inner City School," SCIS Newsletter, No. 11 (Winter 1968), pages 6 and 7.

[4]Mary Budd Rowe, "How It Is," What is Curriculum Evaluation? Six Answers, (SCIS, December 1968), pages 53-57.

and to talk informally with each other about the materials they are investigating is one of the most important moves the teacher can make to foster meaningful language development in the classroom. The kinds of questions the teacher asks can do a great deal to increase or destroy a child's self concept. Questions which encourage the child to report his own experiences, rather than those that require a single, "correct" answer, tend to help the child believe his observations and ideas are important. Using a child's observation or idea as the basis for further questions and discussion shows him that the teacher not only accepts his answer, but actually respects and wants to explore his idea.

The SCIS approach, philosophy and materials help bring about a change in attitude on the part of teachers. Teachers tend to use one or more of the following techniques which are part of the SCIS inquiry style:

1. Participation by children in formulating problems for investigation;
2. Experimental investigations by children alone or in groups;
3. Divergent questioning to stimulate further observations, hypothesis making, and critical judgment;
4. Discussions among children regarding their findings.

In many cases effective teacher training programs emphasizing these techniques have usually preceded and continued in conjunction with the introduction of the program. Through the support of the Cooperative College School Science Program of the National Science Foundation funds have been made available to help support such training in some places. Other communities have carried on training, usually less extensive with other outside support or as part of their local in-service education programs. One of the earliest of these experiences, which indicated the value of the SCIS materials in contributing to the continuing development of the instructional techniques of the teachers involved was reported in 1967 by Dr. Neil V. Sullivan, then Superintendent of the Berkeley Public Schools.

> *A fascinating thing has happened in Berkeley these last three years. We have discovered that SCIS, in addition to being a program that fosters logical thinking and basic concept formation in science, can also be an important factor in the development of language arts and, in general, a stimulus in developing new attitudes toward learning in our first-graders....*
>
> *In the summer of 1966, the focus was changed from the student to the teacher. This came about as a result of the operation of a program funded by ESEA and carried out in the Franklin Title I School. Here the emphasis of the project was the retraining of teachers in order to make them more novel and more*

effective in the instruction of underprivileged children. Again, teachers and children, operating with materials furnished by SCIS, and in workshops conducted by SCIS staff members, brought out clearly the effectiveness of direct experience.

It is important to note that teachers and students were not dealing with imaginary or chance encounters but rather with a series of planned physical experiences in which direct observation led to an increased curiosity, a discovery, a statement--in short, a logical chain in the process of observation, discovery, verbalization. Because of these two experiences then, a new partnership emerged.[5] [See report from Berkeley, page 15.]

With the point of view of this introduction in mind, you are encouraged to read the reports from the field which follow. These should not be considered as a statement of proof that SCIS is the panacea we unfortunately seek so often in education, but rather as early field evidence of the impact that SCIS has had on the educational experiences of disadvantaged children and the quality of their teachers across the country. The final versions of the units in the SCIS program are only now starting to become available through Rand McNally & Company, Chicago. The evidence presented in the field reports is based on the use of preliminary versions of the various units and in most cases reports only the first year or the first two years of the use of the program. No school or school system has used the entire program long enough to be able to obtain meaningful data on the cumulative effects it will have on the elementary educational experience of children, disadvantaged or otherwise.

The "data" presented is soft but clearly indicates the value of the materials and especially the approach to teaching when working with disadvantaged children. Hopefully the combination of the publication of this report and the availability of the final versions of the components of the SCIS program will encourage researchers to carry out the kind of carefully planned, long-term studies which will provide further data on the cumulative, long-term effects of such instruction.

Acknowledgment

I am appreciative of the cooperation of the teachers and curriculum leaders who took time out from their busy schedules to provide the

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[5]Neil V. Sullivan, "SCIS and Language Skills," SCIS Newsletter, No. 10 (Fall 1967), pages 3 and 4.

information for the field reports. Help with the compilation and editing of these reports and the writing of this introduction was provided by Suzanne Stewart and Sylvester Webb of the SCIS staff. The Science Curriculum Improvement Study is supported by a grant from the National Science Foundation.

SCIS IN LOS ANGELES

as reported by Seymour Sitkoff
Director of Elementary Science

The Los Angeles Unified School District in September, 1968, initiated the Science Curriculum Improvement Study program in thirty-five elementary schools representative of various socio-economic and ethnic areas, including the inner city. The program with the support of the National Science Foundation included four phases: (1) a one-week leadership orientation period during which selected supervisors worked with the project headquarters at Berkeley; (2) an intensive three-week workshop during summer, 1968, for 150 teachers of grades 1-2 and 26 supervisors and specialists; (3) implementation of the program for pupils in grades 1-2 in thirty-five elementary schools during 1968-69; and (4) eventual implementation of the program in grades 3-4 during 1969-70 and in grades 5-6 during 1970-71.

The first three phases of the plan have now been completed with teachers at grades one and two using the SCIS units: Material Objects, Organisms, and Interaction. Each of the 150 teachers trained in the program were provided by the city with the necessary instructional materials for carrying out the program during the subsequent school year. Toward the end of the first year's participation in the program, teachers were requested to respond on a District prepared evaluation form according to certain evaluative criteria. The following summarizes some of the pertinent areas of evaluative significance relative to the Science Curriculum Improvement Study program.

Pupil interest in their environment and development of science skills. Teachers indicated that pupils revealed a marked increased enthusiasm for learning and interest in their own environment. Manipulation of science materials, pupil discussion and expression of ideas, use of oral language skills, and observation and description of phenomenon consistently received high ratings. The unit on Material Objects received a particularly high rating for developing the skills of observation and discussion.

The unit Interaction appeared to extensively involve pupils in the manipulation of science materials and the use of oral language skills.

SCIS Preparation Workshop. Teachers stated that the three-week Los Angeles City Schools' workshop was essential for the implementation of the SCIS program. The teacher statement, "It (the workshop) changed my whole concept of teaching in all areas," was repeated frequently.

Role of the teacher. The vast majority of teachers stated that the SCIS program had changed their role as a teacher. Teachers stated that they questioned the pupils more effectively and listened and guided pupils to think for themselves rather than providing answers. Teachers became less talkative, therefore, pupils were freer to discover for themselves and express their ideas as based upon their evidence.

Teacher response has indicated enthusiastic support for the continuation and extension of the program. This has presently been partially accomplished with the phasing of the program into grades 3 and 4 as funds permit. The impact of SCIS in changing the teacher's role in the classroom to become a more effective person in guiding pupils' educational experiences is evident. The important relationship of SCIS to other areas of the curriculum such as the application of oral and written language skills and mathematics appears to be significant and additional research is currently being planned to verify this relationship.

As reported by a teacher in a letter to the Superintendent of Los Angeles City Schools:

We realize that SCIS is only one of many pilot and experimental programs in the Los Angeles School System. Some will prove of short term value, some are merely variations on traditional themes, some are truly innovative and will undoubtedly profoundly affect and strengthen educational processes of the future. We strongly feel that SCIS is one of the latter group.

During the last four years our school has been involved in a number of new programs. In each instance teacher reactions have been mixed, varied and by no means unified. The fact, therefore, that SCIS has 100% enthusiastic backing from all the teachers in the program becomes quite meaningful.

We're delighted with the direct and actual physical and mental involvement of each child no matter the size of the class; with the positive nature of each child's contribution; with the relevance of each area of study to the real life of the child; with the carefully planned sequential concept development and the priceless vocabulary expansion that accompanies it; with the carry-over into the rest of the day's program of the interaction and communication nurtured in the science "laboratory" of the classroom, building thinking habits for a lifetime.

The program crosses all social lines, color and language barriers. Unlike most science curricula the content cannot possibly become outdated.

Not the least of the values of the program is in what happens to the teacher. Science has been badly treated at the elementary level. This is true partly because of a discouragingly low budget allocation (compared to physical education and art, for instance) but also because few teachers are adequately trained in the field. The ill-prepared teacher will "teach" facts from a textbook because therein lies her only security. SCIS is completely prepared for this. The teacher's manual provides her conceptual guidelines, the materials kits provide the children with tools and equipment for exploration and the teacher can become what she should be and what SCIS has planned for her to be...an observer, a guide, a diagnostician, a collaborator in an active, creative, individualized materials-centered science laboratory.

SCIS IN SAN FRANCISCO

as reported by Jean M. Burks
Coordinator Community Education Planning Project
San Francisco, California

The SCIS program is being used by twenty-three teachers in the eleven San Francisco public schools which I visit regularly. Three of the schools have a predominantly Spanish speaking population of inner city children; four have predominantly black inner city children; three are fairly well balanced racially; one is a "white" school with a mix of oriental, black and Spanish-speaking achieved through busing of the "disadvantaged" youngsters from their overcrowded neighborhood school.

In the settings described above SCIS is used in a variety of ways. I will comment briefly on two of the schools.

Marshall School Annex is populated predominantly by Spanish-speaking children. English as a second language is part of the curriculum. The class using Life Cycles includes not only Spanish-speaking, but youngsters from the Philippines who are able to speak to, and are understood only by, a few classmates and some community aides who work in various capacities around the school. The teacher has stated that the Life Cycles unit has been the means by which the class has shared an academic activity in spite of the language barrier. The non-English speaking children seemed to know how to plant seeds, and once they saw the materials and realized what the activity was to be, they eagerly participated. They learned and used operationally such words and phrases as, "plastic cup," "plant seeds," "label," "tape," and "tray." They quickly grasped the concepts of germination, growth, and life cycle. They now had a few more words in common with the remainder of the children and had shared an experience.

Teachers have stated that the SCIS philosophy and teaching strategies have permeated other curriculum areas in their classrooms in the following ways:

> It has freed them to allow the children time to interact, explore and discuss problems and ideas among themselves--even in another language!
>
> It has freed them to allow and even encourage questions which the teachers can't answer, and for which they and the class must search for answers together.

It has freed them of the need to always give the children answers to problem situations.

Lakeshore School is located in a white, upper class neighborhood. Spanish-speaking, oriental and black children are bused to the school. The teacher using Life Cycles at the Lakeshore School is the Compensatory Education Teacher, whose five classes (twelve youngsters at a time attend fifty-minute sessions) include many of the bused children. The compensatory teacher has used the Life Cycles unit as a vehicle for language arts activities. The teacher has stated that growth in oral and written language skills has been a natural outgrowth of the science program. Observing, handling and reporting on the live organisms presents legitimate, real purposes for oral and written expression. The teacher stated that upon returning to the regular classroom, the children have something academic and of value to share. The teacher also states that the experiences with the organisms gives children from very diverse homes and neighborhoods a common bond.

As reported by Victoria Durant, Consultant, San Francisco Cooperative College School Science Project (1969):

There was no formal paper-and-pencil evaluation. Assessment was through direct observation by teachers and the SCIS consultant. The major purpose of the project was to aid in language development; this appears to have been accomplished. The evidence of this success was through the increased vocabulary of many children. The development of keen observation skills enabled the children to better express themselves verbally; they were more articulate and detailed in their descriptions of the objects. Some teachers reported that these skills and abilities became evident in other content areas. Second, implementing SCIS in a large urban area was accomplished successfully. It was evident that the laboratory approach to teaching science can be used as successfully in ghetto areas as non-ghetto areas. The CCSS project was realistic in its program; the number of teachers involved and the kind of training provided added to the probablility of success. Training is a vital part of SCIS, and the follow-up consultant service provides someone for the teachers to use as a sounding board. The use of concrete examples from the participants themselves, classroom visits with almost immediate feedback, and the involvement and support of most administrators were of equal importance in the implementation.

SCIS IN MORGAN HILL, CALIFORNIA[6]

as reported by
Pat Sheffer, Psychologist
and
Geraldine L. Mosegard, Director
Compensatory Education

Morgan Hill Unified School District, Morgan Hill, California, covers 296 square miles. It lies south of San Francisco Bay and extends from the top of the Mount Hamilton Range on the east, across southern Santa Clara Valley to the top of the Coast Range on the west. Parents of our low-income children work in the orchards and fields, the canneries, the trailer factory. Many depend on welfare for winter sustenance. Many are Mexican-American. Others are displaced families from Appalachia....

What hooked the child on language growth? Success was one factor. Teachers were trying not to demand things of him he could not yet do. Through the testing, teachers knew the depth of his individual problems in visual-motor skills as well as verbal development. But a second factor more influential for the child was emerging now. It deeply excited us. A concerned, personal, teacher-child relationship.

We began to see it happen through the use of materials from the Science Curriculum Improvement Study. The SCIS materials are concrete. The children can handle them, sort them into categories, move from concrete to conceptual relationships with them and see their own knowledge grow. This rod is bigger than that rod...but now, look! It is smaller than this rod! That was an important function. But an even more important facet of the kits spread beyond their use, coloring our teachers' entire approach to teaching and learning. This was the program of having the children work together with the materials in small groups, conversing among themselves about what they were doing, while the teacher and aide moved from group to group, listening. Individualized learning began to take place. Children became addicted to learning for themselves and they needed the words to tell each other what they were seeing. They needed language! In the group discussions afterwards, they were given a chance to use their language again, to discuss, to question, to explore, to disagree, and to solve problems.

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[6]Pat Sheffer and Geraldine Mosegard, "A Compensatory Education That Works," SCIS Newsletter, No. 16 (Fall 1969), pages 4 and 5.

But the glorious side-effect was even more rewarding. When a teacher does most of the talking, it is possible to see children as so many objects. Just so many bodies doing the same things on the same sheets of paper. In the resulting evaluations we see the child in terms of skill levels. That's Johnny. He's good in arithmetic, but poor in reading. It isn't on purpose. It just happens somehow. And this system is perpetuated by insisting that children should not talk in school--just listen and learn while we pour information into them like so many jars.

Now that our emphasis has been placed on language development, SCIS materials have forced teachers to be less vocal because the children get so excited about their objects that they tune out the teacher! Consequently, we teachers are made to face our pupils as human individuals, each with his own way of thinking, feeling, learning. We cannot keep that teacher-child distance we were taught to hold in some reverence. We cannot keep that image of always having the right answer either, and this gets a little frightening. I think of the class of first-graders identifying an object. "Made of plastic or metal?" they wondered. A thoughtful child asked the authority--the teacher. "I think it's plastic," the teacher replied. "Oh, you agree with Henry," commented another child in the group and the discussion continued. This teacher was pleased not to be seen as the final authority on "right" answers.

SCIS IN BERKELEY

as reported by Harriet G. Wood
Director of Elementary Education
Berkeley Public Schools

General consensus was that the SCIS materials and approach "turns on" children. Many teachers preferred discussing the program in terms of all the children in their classroom and not labeling them as "advantaged" or "disadvantaged." They see the program as one needed for all pupils because all need stimulation.

Consensus of the majority respondents is that SCIS awakens interest and desire to explore and to experiment. It gives children an "active role"; allows them to "handle material at first hand," "encourages investigation," "allows a feeling of discovery." Teachers approved of the program because it allows children to reach their own conclusions, to be involved, to be free to participate. Reinforcement of communication skills without dependency on reading or previous knowledge or experience was cited by numerous teachers as an advantage of the program. Other comments are: opens doors of appreciation and wonder of the natural world; allows much individual experimentation; conclusions and discoveries are not judged by any arbitrary standards; provides opportunities for re-evaluation of conclusions; offers concrete materials to work with; gives a chance to share ideas; allows for a sense of success; spurs the pupils to look clearly at their environment; exposes them to new vocabulary and new objects.

On the matter of effect on the teachers of the SCIS program, the response generally was that it stimulated them to more meaningful performance in the area of science. One teacher reported: "It helps me to view an environment in a fresh way by seeing it through the children's eyes and words instead of in just my own way of perceiving it." Another commented: "I am trying to encourage my pupils to give their opinions as to what they observe and to listen to their classmates' ideas."

Other teachers observed: "I feel that I have more to offer each child because most of the equipment I need is available in the classroom. The lessons are set up so that I can interject my own ideas and relate the lesson to other classroom activities." "The enthusiasm makes it easy to arouse interest." "Teachers of this program learn not to be authoritarians. They create a curious environment which will promote discovery by the children themselves."

Numerous teachers reported that SCIS was "the most exciting" program they had ever been involved in. Several said they felt more effective

as teachers when working with SCIS materials. Most cited "pupil involvement and participation" as a prime advantage of the program. Many said SCIS gave them the opportunity to learn more about their pupils--the ways they think, the things they care most about. "Enthusiastic response" from the students is another factor cited by the majority.

One teacher observed: "It gives me confidence to teach something that holds the interest of the brightest child and continually stimulates the interest of the 'slower' child."

Another said: "It provides a more enriching, open atmosphere so that each individual feels a part of the classroom. It is our laboratory and not just the teacher's room."

Another commented: "It gives an equal opportunity for participation to all children. The emphasis on 'all responses are important' gives confidence to youngsters who rarely have 'right' answers." Another's response was: "I feel that with this program it is possible to make science exciting and understandable to all children."

As to effect on class and/or school, most teachers responded that the effect was a positive one. They used such phrases as "fosters scientific thinking," "generally interested and curious," "provides opportunity for cultural mixing and allows non-readers to 'shine' in observations and logic," "something for everyone," "eliminates gaps between ability groups," "gives class a sense of unity," "enjoy sharing discoveries," "all responses are appreciated."

One teacher observed: "The disadvantaged child is turned on. He can experiment on his own level. There is no right or wrong to his answer. What he has to say is accepted. For this reason, his security is not threatened as it is, for example, by math."

As reported by Dr. Herbert Wong, principal of the Washington School in Berkeley where SCIS units have been used since 1963:

One way to fight cultural bias is through an inquiry approach to science like SCIS, where phenomena in the classroom laboratory are the topic of the investigation. The inherent nature of science...transcends categorization of ethnic segments of our young urban populations as the synthesis of content and process activates interest and enables the children to conceptualize. The "disadvantaged" child is, therefore, not placed in a disadvantageous position in contrast to the inequities of the more traditional type of elementary science curriculum.

SCIS IN HAWAII

as reported by Dr. Albert B. Carr
Professor of Science Education
University of Hawaii
Coordinator, Hawaii SCIS Trial Center

The following comments from four SCIS first-grade teachers in Honolulu Public Schools are representative of the overall reactions at the Hawaii Center to this materials-centered, laboratory approach to science in the elementary school. The teachers were asked how SCIS has affected other areas of the total school program.

Teachers A and B

1. Language Arts
   a. The children are more descriptive in oral and written work because they tend to be more observant.
   b. Colorful in description (use more adjectives).
2. Math
   a. Math works beautifully hand in hand with science.
      (1) in comparisons children are able to see relationships large-small, more-less
      (2) working with sets and subsets
      (3) working with grouping and number facts
3. Helps improve their thinking especially in drawing conclusions or critical thinking.
4. Oral Work
   a. More active participation in discussion (probably due to the laboratory type of activity where the child expresses what he observes).
   b. Child is freer in speaking up and expressing his thoughts.

Teachers C and D

1. The children have become more observant, and are able to note far greater details.

2. The children are more effective in describing what has been observed, and they are less apt to dwell on the functional aspect of an object.

3. The children frequently use the vocabulary learned in SCIS in their speech and writing appropriately; showing ability to make relationships between what has been learned and old and new experiences.

4. The children seem to be doing more independent thinking. It seems as though SCIS has helped to give the idea that each one has something worth contributing...the attitude being that the more ideas we have, the better. Furthermore, we have more children willing to disagree and to challenge an idea.

5. The children question authority of teacher, books, and pictures more readily, and ask for more proof or evidence when they are in doubt. Examples of this came up from time to time, and this questioning attitude has helped them to decide on the course of action they have taken, either individually or as a group. Whenever the children felt we had sufficient evidence, they were quite eager to try new things to find out.

6. The children have used more colorful words, and their vocabulary seems to be larger.

7. The children seem to have a better idea of arithmetic concepts such as greater than, less than, equal to, after working with objects, and they seem to have gained the idea from SCIS that size factors are relative to what we are referring to.

8. The children seem to be seeing things differently. That is, during Social Studies periods, they tend to describe pictures of the films in terms of properties, and specific things seem to catch their attention. The children, for instance, described the elephant's skin as "wrinkly, crusty, dusty, and dried up--like my old leather shoes."

9. The children stay interested in various projects (e.g. 21-day incubation of eggs) longer because they seem to have the ability to look for different things and wait patiently for systematic investigation and evidence.

10. The children bring objects from home daily, and use them for sharing with the class during sharing time, but, regardless of what the object is, they almost always ask for the others to guess the properties first of all.

11. The children want to touch and feel everything, it seems.

12. The children are more experimental and try novel things with materials on hand.

Feedback from children, teachers, parents, and administrators in Hawaii has been and continues to be extremely positive in regard to the SCIS approach and materials. There seems to be rather general agreement that SCIS in the elementary program improves the educational opportunities of our children. And many of these children are in some ways different from children in most other places in the United States. Many of the SCIS center schools in Honolulu are center city schools.

SCIS IN OKLAHOMA

reports collected by Dr. John Renner
Professor of Science Education
University of Oklahoma
SCIS Trial Center Coordinator

Reports by Oklahoma teachers:

From my observations I think that with most of these children it is the first experience they have ever had with physically handling any equipment themselves. They have learned to relate things they have learned in school to everyday situations. Some have done experiments at home on their own initiative and reported their results. There has been an active enthusiasm shown to find out more about things initially begun at school. They show more of an awareness of things about them and an interest in what is happening around them than they did previously.

The inquiry method of teaching benefits the deprived child in many ways. He is placed in small groups, is given opportunity to speak his thoughts and therefore contributes to his group. He is not rushed for an answer and is given the privilege of manipulating and sorting objects. He is provided a relaxed learning situation where pressure has been lifted and interesting tools provided for his discovery. As he succeeds he is able to feel more worth in his ability.

Methods of inquiry and discovery can be used profitably in classes that include pupils of different background experiences. Wide experiences may enrich a pupil's approach to a problem but it is not crucial to his use of, or understanding of, the concrete things presented to him for manipulation, experimentation, or observation.

Children from deprived backgrounds can be helped, by these science activities, to develop more initiative, to become more independent in their work, and to build confidence in themselves. The process requires the pupils' "doing." When he is provided the materials and the opportunity to experiment, to plan, to test, to observe, and to report on an activity he feels a sense of personal accomplishment. His self-esteem is improved with an awareness of pride when he can contribute to the class discussion as well as his peers and this is "good."

M.C. Weber, Professor of Science Education at Southwestern State College, reports on his work in a compensatory education program for Indian children in Oklahoma:

The SCIS materials were quite adaptable to these Indian children. One of the problems in Indian education is the inability or lack of desire to communicate. Through the materials, we actually didn't have this problem. These kids were just as vociferous as any in the public schools. In fact, the teachers stated that some of the kids started talking only after they were involved with the materials.

Another problem with Indian children is the absence of strong individualism. The processes of the SCIS approach aided in the development of individualism. For the Indian child to stand before his peers and strongly state his observations of a rock is just great.

Because all the Indian children were under-achievers in public schools, they actually hadn't experienced much educational success. The SCIS program aided them in attaining this success, many for the first time.

SCIS IN THE ARCHDIOCESE OF CHICAGO

as reported by Sister Mary Ivo Miller
Consultant, Fisher Scientific Corporation
formerly Director of Science, Archdiocese of Chicago

The major benefit of SCIS when it is used with disadvantaged children is the creation of an enjoyable learning experience. Happiness is being able to do something. Most children come to school sad faced. When they begin with the activities in Material Objects or Organisms their faces light up. They are experiencing something different from their outside lives. They have pride in being able to do something themselves.

Children who come from Puerto Rican or other Spanish-speaking backgrounds and understand very little English do not have to be able to read or write. This is an area where they are able to do something and there is no language barrier. In one school a girl who knew a little English explained to another child and their faces lit up. The children are able to accomplish something and they manage to do a great deal without reading. There is the communication of the object itself and with little direction they are able to accomplish the activity. Their happiness is most remarkable.

It is difficult to judge the effect of the program on language development. As an observer of many inner city classes, I am beginning to believe that it does facilitate language development. There is a great deal of interest and children are very enthusiastic about the science program. Children are able to communicate about the program at some length. This does not happen in other subjects.

SCIS IN CHICAGO

as reported by Lucille Connelly
Acting Director, Division of Science
Chicago Public Schools

Disadvantaged children using SCIS are having a creative, stimulating educational experience. It is important to understand that these children are otherwise experiencing extreme difficulty in reading and the basic skills. They have experienced failure from the beginning of their school career. Motivation--creating the desire to learn--is a problem faced by most of the inner city teachers.

On one of my visits to a first-grade classroom I observed an experience chart story written by the teacher and dictated by the boys and girls. It went: "Today we had visitors. We enjoyed working with our objects. We put our objects into groups."

This is an indication of applications teachers can make from the science activity and the motivational aspects for children.

SCIS provides the materials and presents problems creating a situation where children and teacher can interact. Teachers report that children using SCIS have more opportunities to handle a variety of materials which present opportunities for oral language development. This kind of situation extends the child's creativity and provides the basis for peer interaction and idea formulation. In all instances at this very early stage in the trial of SCIS materials the pupils appear to be developing a greater means of verbal expression through discussing the science experiences.

SCIS IN CLEVELAND[7]

as reported by Richard T. Codispoti
Science Coordinator, Cleveland Public Schools

Opinion of most subject supervisors in our system indicates that conventional and traditional approaches of education are not entirely applicable to inner city children. Because of a lack of motivation and experience, the inner city child often exhibits a deficiency in many basic readiness skills for school learning, as well as certain development motor skills particularly related to success in usual primary school programs. These factors must be considered in structuring and introducing any new program.

Before a different primary science program could be considered in Cleveland, the Division of Science conducted a study of the inner city child involving selected primary classroom teachers, the Division of Research and Development and other subject area supervisors. Certain fundamental observations and objectives evolved from this study to provide, in our opinion, a better picture of the child in the inner city.

Our study indicated that the inner city child has developed a pattern of learning through action rather than through words. All young children respond more readily to the concrete rather than to the abstract. Our study showed that immediate, tangible rewards have more meaning to the inner city child than long-range goals. Most often he is motivated to extend himself academically when he is exposed to external stimulation. We found that the urban child learns best in an atmosphere that is both structured and permissive. Activities that provide a gradual period of build-up experience (such as those at the beginning of the SCIS unit, Material Objects) appear to support the development of a level of readiness in inner city children. This helps to meet problems such as differentiating betwen rough and smooth or noting differences among various objects in terms of size, shape, and so forth.

The Cleveland Public Schools examined many programs; it was decided that SCIS might provide the structure and activities that could very well serve to accomplish some of the needs and objectives outlined earlier. Over a period of 18 months, SCIS units were implemented in two classes of each of the first three grades in 61 inner city schools.

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[7]Richard T. Codispoti, "SCIS and the Urban Community," SCIS Newsletter, No. 15 (Summer 1969), pages 1 and 2.

The unit Organisms is being used in grade one, Material Objects in grade two, and Interaction in grade three. Material Objects was the first unit to be implemented in February of 1968; Organisms and Interaction were introduced later, in September of 1969.

Early returns indicate that placement of Material Objects and Interaction one grade higher than the lowest level recommended by the developers of the SCIS program provides challenging and satisfying experiences for the greatest proportion of children in each grade. Reasonable success and growth seem to be taking place with a high degree of interest apparent in all classes. To date, Material Objects has been the most successful unit in terms of developing readiness skills. A tremendous increase in the children's use of language has been observed in response to SCIS materials. Children who were almost non-verbal have been anxious to talk about what they are doing. Our teachers have done a remarkable job in allowing children to build personally meaningful vocabularies to describe characteristics of materials. For example, a child observing a rock for its texture can use any of the words "rough," "coarse," or "bumpy," and feel rewarded and "right." Most of their answers in developing color, texture, and shape words go unrejected and they experience degrees of success and want to talk about it. Teachers have noticed a carryover of this increased interest to verbalize into the language arts and mathematics areas.

The classification activities in Material Objects also provide great latitude in a child's ability to sort objects based on his power to discriminate between properties of various objects. The inner city child seems to develop a greater confidence in himself as a result of these experiences and appears to become more aware of the world around him.

SCIS IN PHILADELPHIA

as reported by Claude G. Walls
Science Consultant, District 4
Philadelphia Public Schools

Nowhere in the elementary school curriculum was there more inactivity on the part of teachers, and more interest on the part of the pupil, than in the area of science. Until recently, science was considered an extension of the social studies lesson. Whether or not science was taught was dependent upon the teacher's interest in the subject. For the most part, a lack of background in science or a lack of meaningful instructional materials was used as rationale for not teaching the subject.

Fortunately, in Philadelphia, a concerted effort to improve pupil performance in basic skills coupled with a genuine desire to make learning meaningful for each child, brought about the introduction of the Science Curriculum Improvement Study methods to the elementary school curriculum. The theoretical background for the SCIS program was found to be scientifically sound, the units meaningful, and they could be introduced to the classroom with a minimum staff development period for teachers.

Is the SCIS program relevant to the needs of the inner school child, and how would this program fit into the over-all scheme for improvement of basic skills? This was the big question that had to be answered.

Quality Now - A Five-Year Plan for Educational Progress. In the North Philadelphia section of District 4, twenty schools serve 30,000 children. Many are black and continue to suffer the inequities of the past: the almost inevitable "separate and unequal status" of the segregated situation. To help achieve quality education in this district, a five-year plan (1968-73) has been developed. Long-range goals and priorities and short-range objectives distinguish it from the vacant promises that are often a part of programs such as this.

With so many programs swirling around education in the district, it seemed imperative to define the course and to map the direction our schools would take. Priorities became the first concern. "What do I want to do most for my children?" parents asked. "What do we want most from education?" pupils began to ask. "What should be our priorities in educational goals and objectives?" teachers and principals were asking.

All agreed that clear-cut goals and objectives, with clear-cut programs for implementation, must be communicated to everyone who had a stake in school improvement.

New--or at least expanded--dimensions in this activity of planning for schools has been the breadth and depth of grass roots community involvement and participation.

With a clear cut mandate for improvement and change, those involved in elementary science took a long look at our science curriculum. In June 1968, the Elementary Science Committee produced a comprehensive survey and report on science teaching practices at the elementary level, and made recommendations for change.

As part of this plan SCIS materials were piloted in eleven schools under the leadership of a science consultant in District 4. Forty-five teachers took part in this program of staff development in science using the SCIS program.

What was found to be encouraging was the self-confidence and interest of teachers involved with the SCIS staff development program. Certainly these teachers were inspired, but could they generate the same kind of interest to their students?

A follow-up program consisting of classroom visitations by the science consultant, periodic seminars during lunch breaks and further staff development with teachers initially in the program was instituted to determine how well the program was being received by children in the various schools and whether the original enthusiasm and interest engendered could be sustained. In all of the classrooms observed, the SCIS programs were being presented on a regular basis. Pupils were responding eagerly with an active zeal that comes spontaneously from children absorbed in doing what they consider important and interesting, and the teachers consistently looked forward to the science period as a time when something really happens.

In one school, parents were invited to visit the classroom during the science lesson. They were asked to participate in the lesson along with the teacher and her pupils. There was a natural reluctance to become involved at first, but as they observed the progress of the lesson, the lure of touching and "working" the materials was just too much of a temptation. Besides, here was a teacher, an adult like themselves, involved with children, doing many of the things that they were doing. Here was an active participating teacher, not one who stands in front of the classroom dispensing pearls of truth and wisdom for docile children to copy and study. It was clear that seeing their children actively engaged in "schoolwork" on their own and actually enjoying it gave the parents a new sense of pride and interest in the functions of "their school."

In another school, a third-grade teacher decided to rearrange her curriculum in an effort to improve reading comprehension. At the beginning of each school day she had begun her lessons with a standard basic reading program.

In spite of her competence as a reading teacher, she was dissatisfied with pupil gains in terms of word meanings and sentence comprehension. The children appeared to attend to what they were doing. But, they were not progressing, nor did they appear to want to progress. On alternate days, the reading period was followed by the science lesson. Consistently, during this time, the activity and interest levels of the children increased. More importantly, the science period was followed by a fifteen-minute free reading period before recess. The small science library in the classroom was stripped bare as were several reference books dealing with the ideas of science. Further investigation on the part of the teacher showed that these children had no difficulty understanding the meaning of words and phrases in the science books.

The teacher, with the help of the reading adjustment specialist and the science consultant, put together a program emphasizing the SCIS science units as a springboard for stimulation in reading. SCIS materials were coupled with specially prepared lessons designed to strengthen the general ability to comprehend the meaning of the written words.

The idea of using the SCIS science program as a stimulus for the reading program is not a replacement for basal programs. Many kinds of experiences can lead to growth and the acquisition of basic skills--experiences in science, mathematics, social studies, art and music. These experiences are not discrete and unconnected. The child is able to see their interrelatedness in all that surrounds him. Concrete experiences gained through the interaction of related and unrelated systems give meaning to words and ideas that signify an experience. Many children may be able to significantly improve reading skills through the continued use of science experiences that help them find out about things they are interested in.

While it is too early to document improvement in reading on standardized instruments as a result of SCIS science units as a focal point for curriculum improvement with the third-grade class, it is clear that the desire to read was enhanced because the children's experiences with materials gave the search for further information meaning and value.

Children are curious and interested no matter who they are and where they come from. True, the inequities of a substandard environment create differences in the child's perspective. His points of reference as well as his meaning of value may be different than those of his more fortunate peers. But he is curious, and he wants to know. Programs such as those developed by the Science Curriculum Improvement Study enable the child to start where he is, regardless of condition and to proceed to use his imagination and to seek new approaches to pertinent questions. In short, children can develop a sense of understanding about themselves and their environment and the ability to change pessimistic assumptions about themselves in the light of new evidence gained through the development of a scientific attitude toward their world.

SCIS IN WASHINGTON, D.C.

as reported by Reuben Pierce
Director, Department of Science
Public Schools of the District of Columbia

My opinion of SCIS comes from my own teaching experience, my own observations and from feedback sessions with teachers.

When disadvantaged children are first introduced to SCIS, they seem lost and apathetic. They look around to see what the other children are doing. They seem afraid to touch or handle materials initially. The children sit and look at each other and have practically nothing to say.

One thing that has come out of the reports is the increase in verbal activity. Children become more verbal and articulate. They don't always necessarily read better, but they do express themselves clearly. It is the interaction with materials and the way SCIS develops basic concepts that enhances language development.

When children are given the opportunity to work through SCIS, their interest and enthusiasm for science is considerably different. Even discipline problems cease to exist when the science lesson begins.

The direct effect of the program is illustrated when children begin to feel free to express themselves constructively. They begin developing a positive self-concept. For many disadvantaged children they are having a successful experience for the first time and this motivates them to do more and enhances the self-image. Much of this negative self-concept is a mirror of the socio-economic environment: the way these children are forced to live. SCIS gives them an opportunity to crawl out of this.

Kids enjoy the materials and it gives them some sense of possession. It is very important for disadvantaged children to have possessions. In their home life they never know if the things they have today will still be around tomorrow. Even shoes may be stolen from them. Children begin to have new values. Youngsters from disadvantaged homes who have hung on to their own few possessions now learn to share experiences and materials, and their ability to handle the school's social setting is enhanced. Generally children are selfish with things, but when they realize that the materials are going to be there, they become willing to share. These disadvantaged children are not used to having things that belong to them and that will remain in the same place, and they begin to protect the materials.

Teachers generally feel that SCIS is a good program, mostly because of the materials. Our teachers have not had teaching materials like this. Most science teachers have just read about science in the classroom and have not had actual science materials to use. They find that even children with reading handicaps become involved in the program.

The teachers themselves become more interested in science and don't just give up the idea of teaching science. One teacher told me, "An SCIS teacher has a great opportunity to observe children and see how they function." It gives the teacher a chance to see and hear what children are doing and to be able to remedy the problems that exist with some children.

Individual teacher's report:

The unit Relativity is of great importance in developing social attitudes of the disadvantaged. He learns to assess information objectively and from some point of view other than his own.

The greatest effect that SCIS has had on the child in my school may not be one of scientific value but more of social value. The child has been given something of his own, although it may only be for that class period. As a result the child looks forward with curiosity to see what he will have next. He also feels free to explore these objects, without being cautioned to be careful. Every child possesses natural traits of curiosity. In many instances in the disadvantaged child due to a lack of time and materials this curiosity has quite frequently been overlooked. SCIS makes use of this natural instinct and, properly channeled, this instinct for curiosity is directed to discovery.

I will cite one specific incident of the effect SCIS has had on one class of fifth-graders. The children in this class all have distinctly different personalities. They are known to be unruly. However, when this group comes to science (their unit is Systems and Subsystems) a complete change takes place. They are no longer outstanding disciplinary problems because they are busy and challenged and are also using individual materials.

SCIS IN NEW JERSEY

as reported by Dr. Edward F. Ward
Professor of Science Education
Paterson State College, New Jersey

From classroom observations and teacher workshops, the following observations have been made regarding children using SCIS in Paterson and West Caldwell, New Jersey.

Children become increasingly aware of themselves as contributors in classroom activity, not only during science experiences, but throughout the entire day. The activities build self-confidence and the ability to express orally an interesting experience. Children with language difficulties are able to work effectively with the materials, thus bridging the gap between Spanish and English speaking children.

Because the program involves pupils in the use of process-oriented skills to develop basic science concepts, children increase in their manipulative skills, learn to work and share materials in small groups, and generally develop increasingly longer attention spans. Children develop the ability to observe and discriminate (e.g., children describe in detail the properties of an apple when it is held up by the reading teacher instead of just identifying the word apple). They discover the "openendedness" of the activity and push further towards uncovering more information.

SCIS IN NEW YORK CITY[8]

as reported by Mary Budd Rowe
Professor of Natural Science
Teachers College, Columbia
Coordinator, SCIS New York Trial Center

Disadvantaged children exhibit a grammar and syntax deficiency which will have a negative effect on the development of conceptual skills. Some recent language studies with these children indicate they miss final sounds. This means that making comparisons (e.g., greater) upon request is almost impossible, and too, that the errors of tense and number are high. This certainly has relevance for science. It is my guess that activities like those in Material Objects, where comparison, sorting, and description are emphasized, will increase the attention of the child to final sounds.

The children talk as much in ghetto schools as in suburban schools, but they are more prone to leave the talking to times when no adult is present or when a high motivation situation exists. In science class, where the children work with equipment in small groups independent of the teacher, they are able to relate to each other in this way. In one experimental teaching class, pairs of children were brought together to work with science materials. These children had been ranked by their schools according to their verbal skills. When it could be arranged, we grouped these pairs in the following combinations:

A:	Hi Verbal	Lo Verbal
B:	Hi Verbal	Hi Verbal
C:	Lo Verbal	Lo Verbal

Observers asked to identify which combination was at work usually were not able to recognize the low verbal child. There was no consistent response for the Case A combination, and the Case C (Lo Verbal) combination was often (7 times out of 10) identified as Case B (Hi Verbal)!

There seems to be little doubt that, in general, the children enjoy the science and can talk increasingly freely about what they observe. We

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[8]Mary Budd Rowe, "SCIS in the Inner City School," SCIS Newsletter, No. 11 (Winter 1968), pages 6 and 7.

took samples of actual numbers of sentences spoken during science, language arts and mathematics programs. The most spontaneous language (and the most subject-relevant talk) occurred in the science lessons. (The science exceeded the language arts by 200 per cent.)

Trying to construct a language system that corresponds to the real world is enormously difficult for children. I am convinced that building this structure goes very slowly when the child is in the position of constantly replying to a bombardment of questions from the teacher. SCIS teachers are learning to listen or wait longer after they ask a question. We found that ordinarily, teachers tended to wait longer for bright youngsters and to give slower children in the same class less time for a response. The development of language goes much faster when the child has an experience and practices telling about it, checking what he says with what other children say. The SCIS teachers generally exhibited a style of teaching during the science lessons that minimized the inquisition so common to instruction. The children, in their turn, responded by becoming increasingly assertive about their observations.

Every child in the SCIS program works with materials designed to provide a sequence of experiences that will stimulate the development of a conceptual system characterized by its adaptability to a variety of circumstances. To "grow" a scientific think system takes time and lots of shared experiences. Children have to make mistakes, just as scientists do. They have to try out ideas and decide on the basis of evidence rather than fiat--which ones to keep and which to let go. It takes a great deal of trust to do SCIS. Children have to learn to trust their own ability to get evidence and make something of it. Teachers have to learn to trust children enough to let them attempt something which they themselves never experienced.